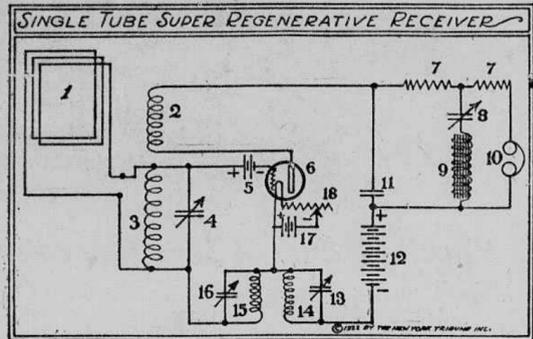


# The Tribune Radio News of the Air Routes By Jack Binns

## Armstrong's Radio Flivver Is Described

### Value of Parts Used in His Remarkable Adaptation of Epoch-Making Super-Regenerative Invention Given

### Uses Only 1 Vacuum Tube Which Acts as Regenerator Oscillator, Detector and Amplifier Simultaneously



The above diagram shows the Armstrong super-regenerative system employing one vacuum tube only. In this circuit the single tube acts as a regenerator, oscillator, detector and amplifier simultaneously. The constants of the circuit are as follows:

1. Loop aerial, twelve turns on a 3-foot frame, wired spirally.
2. Secondary of the regulation vario-coupler with twice the usual amount of turns.
3. Primary of vario-coupler, 4. Variable condenser, .001 mfd. capacity.
5. The battery, 4 volts maximum.
6. Vacuum tube, 7. Resistances, 12,000 ohms each.
8. Variable condenser, .001 mfd. 9. Iron core choke, 100 millihenries inductance.
10. Telephones, 11. Fixed condenser, .005 mfd. capacity, 12. "B" battery, 80 volts.
13. Variable condenser, .0005 mfd. capacity, 14. Duo-lateral coil, 15,000 turns.
15. Duo-lateral coil, 1,250 turns.
16. Variable condenser, .005 mfd. capacity.
17. Storage battery; 6 volts for UV 201, or 8 volts for UV 202.
18. Rheostat.
19. Condensers 13 and 16 do not necessarily have to be the ordinary variable condensers. They can consist of ordinary fixed condensers, arranged to a multiple switch, so that the total maximum values given can be built up by means of the switch.

## Armstrong Was First to Clearly Understand Vacuum Tube Action

### In a Brief History of Radio, Professor Morecroft Declares That De Forest, Inventor of the Three-Element Tube, Didn't Know Its Function

In a brief history of radio development in "Radio Broadcast" Professor H. Morecroft, after giving full credit to Dr. Lee De Forest for the invention of the three-element vacuum tube, states that the inventor did not understand the functioning of his invention. He then declares that E. H. Armstrong, the young radio wizard of Columbia University, was the first man fully to understand the action of the tube. In reviewing Armstrong's work the professor says:

"During 1911 and 1912 E. H. Armstrong was studying for the degree of electrical engineer at Columbia University. He was not an especially brilliant student; in fact, in many of his courses he did rather poorly. The writer knows because Armstrong was one of his students. The character of alternating current machinery in general did not prove very enticing to the young student, not because he was lazy or indifferent but because he had a hobby—and a vision. He was experimenting at his home with wireless apparatus and trying to find out how the three-element vacuum tube of De Forest worked. If De Forest confessed in public that the action was too mysterious for him to explain, then Armstrong, who was a practical man, did not do so. He promised to do, and did very shortly.

"After graduating, Armstrong continued at Columbia as assistant to the writer in the radio laboratory. Later he worked with Professor M. I. Pupin, continuing his study of the three-element tube. As the writer looks back to those days it seems undoubtedly true that Armstrong understood the action of the vacuum tube better than any one else in the world. Day and night he thought and talked of nothing else but the vacuum tube; his devotion to this study and perseverance therein finally brought rich reward—he was granted a patent, the validity of which was recently confirmed, which gives to him credit for being the first really to understand the action of the three-element tube."

After detailing the work that led up to the discovery of regeneration Professor Morecroft continues: "Armstrong's idea evidently enables the vacuum tube which is being used as detector to act also as generator of the high-frequency currents which are used to produce the beats when the continuous wave signals arrive. Not only does the simple coupling idea of Armstrong thus permit the audio to act as a receiver of continuous wave signals, but it also makes it an extremely sensitive receiver at the same time if the adjustments are carefully carried out.

### Foiled the Engineers

"The writer well remembers one night, before Armstrong had published his explanation of the action of the vacuum tube, spent at Marconi's new station at Belmar, N. J. Mr. Weagant, the chief engineer of the American Marconi Company, and Mr. Saroff, at present manager of the Radio Corporation, also were witnesses of these early tests when Armstrong showed us how his circuits could 'pick up' a continuous wave station on the Pacific Coast—stations with only a few kilowatts of power.

"To hear the note of the station changed at will by the turn of a handle on one of the boxes was a severe puzzle for the Marconi engineers, especially as Armstrong, like a proper inventor, had everything completely hidden in boxes, with the lids securely screwed down. And many a chance did the chief engineer have to peer inside! He would surely have been surprised had he seen how simple the whole thing was."

### "Aviation" Urges Radio On Aircraft in Editorial

### Shocked to Hear Navy Flying Boats Still Rely on Pigeon Messages

To the average person perhaps the most striking thing about radio is its simplicity. In the recent balloon race of the contestants, who had never had previous radio experience, took up a set which had been hurriedly mounted but a few minutes before the start, with an instrument weight less than fifteen pounds. They received clear reports and music at all stages of the flight.

It comes therefore as somewhat of a shock to learn that on its seaplanes the navy still prefers to use pigeons for their greater reliability in an emergency. Evidently airplane radio has not yet reached a point of "selling itself" completely.

### How Capacity Can Be Changed

One method of changing capacity in a circuit is to change the number of condenser plates. A second method is to change the capacity of a single condenser. This is done by having two sets of plates that make a condenser movable in connection to each other. When every part of the plates in one set is opposite plates in other, capacity is greatest.

### Nantucket Wants Radio Beacon

A request for a radio fog-signal station on the Nantucket lightship, similar to stations already established on the Fire Island and Ambrose Channel lightships, has been made by H. H. Raymond, president of the American Steamship Owners' Association, to the United States Lighthouses, Washington, D. C.

## Cross-Country Amateur Test Successful

### American Relay League Puts Special Messages Across Thirty States for Police Convention With Success

### Third Test This Year Others Were Trans-Atlantic Telegraph With Low Power and Cross-Country Test

The second great transcontinental radio telegraph test conducted by the American Radio Relay League was completely successful, and again demonstrated the importance of the magnificent organization built up by the amateurs of this country in cases of national emergency. The test was conducted on June 3, 4 and 5 without any pre-arranged details.

During the three days no fewer than 134 messages were dispatched across the country, despite the very bad atmospheric conditions which prevailed during the period. These messages were delivered in thirty states and two provinces of Canada, according to latest detailed reports.

### Three Successful Tests

The first was the famous trans-Atlantic test during which Paul Godley succeeded in receiving messages from 27 amateurs in this country at the temporary station which he had erected in Scotland. None of the 27 stations was using more than one kilowatt of power in the transmitting apparatus.

The second successful test occurred when congratulatory messages were transmitted to President Harding by the Governor of every state in the union on the occasion of the first anniversary of his administration. In this test such messages were received in Washington within the time limit set by the officials of the league.

The third test, which was held in June, was undertaken in conjunction with the annual convention of the International Chiefs of Police organization. The results have just been tabulated and show complete success. In this test no details were prepared in advance, and it was by the time the network of communication built up by the league and gives an idea of its value in cases of emergency.

### Has Been Used Locally

The system has already had several local emergency tests, particularly in the explanation of the action of the vacuum tube, spent at Marconi's new station at Belmar, N. J. Mr. Weagant, the chief engineer of the American Marconi Company, and Mr. Saroff, at present manager of the Radio Corporation, also were witnesses of these early tests when Armstrong showed us how his circuits could 'pick up' a continuous wave station on the Pacific Coast—stations with only a few kilowatts of power.

"To hear the note of the station changed at will by the turn of a handle on one of the boxes was a severe puzzle for the Marconi engineers, especially as Armstrong, like a proper inventor, had everything completely hidden in boxes, with the lids securely screwed down. And many a chance did the chief engineer have to peer inside! He would surely have been surprised had he seen how simple the whole thing was."

### Navy Opens New Compass Stations on the Lakes

### New Stations Are Expected to Eliminate Dangers at Lakes

Three new radio compass stations have just been completed by the Navy Department at Grand Marais, Whitefish Point and Point Detour, Mich. They will serve the stations on the Great Lakes, and will help to prevent accidents and save lives.

### National Value Shown

"The idea of the relay was to show the national value of the telegraphing amateur in times of emergency, which is borne out by the fact that no station was out of order when this message was started. It originated at San Francisco and spread over the entire United States and Canada like a huge cyclone. In some cases the message was picked up at a distance of 1,500 miles. In some parts of the country lightning storms interfered with the reception and transmission, but the 'stickto-itiveness' of the amateur radio operators even under the most trying circumstances.

"Neil B. Judkins, radio 1PM, of Warren, Mass., was the 'radio Paul Revere' who delivered the message to the police chiefs and sheriffs in central Massachusetts.

"Chief Vollmer has thanked the members of the American Radio Relay League for their efficient radio communication, and on numerous occasions he has called upon amateurs to assist in conducting experiments concerning the apprehension of auto thieves in California.

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### Rocky Mountain Crystals

Get acquainted with the marvelous sensitivity of this crystal, which is more sensitive than any other. Mounted 15c. Unmounted 10c. Postpaid. Rocky Mountain Radio Products, Inc. (Incorporated July 10, 1922. This offer expires July 15, 1922.)

## First Aid for the Radio Fan Using Dry Cells for Tube Filament; Parts in the New Armstrong Circuit; Character of Current in Telephone

### Using Dry Cell "A" Batteries

Question—1. Could a 6-volt dry battery be used as an "A" battery? 2. What kind of wire should be used to hook up a set?

Answer—1. A six-volt dry battery cannot be used successfully to light the vacuum tubes, as the tube requires far more current than the dry cell can give. Under the circumstances, therefore, a dry cell battery will be a greater expense to you in the long run than will the storage battery. 2. Use No. 18 copper wire for making the connections to your set.

### Other Armstrong Circuits

Question—Will you be kind enough to inform me about when you intend to furnish the complete data of the other hook-ups of Armstrong's super-regenerative receiver? I would like to construct a set, but I have not had time to do so. I can hear the music. Although I am an ardent radio fan, I have not yet constructed a set. I have, however, felt that the really practical and ideal receiver for the amateur is the super-regenerative receiver. I feel that it has arrived in the Armstrong circuit, and I should like to construct one. I have a number of fixed one-plate tubes. Will you have some information about the other hook-ups of the super-regenerative receiver? I have two hook-ups at two or three weeks ago?—A. B. C.

Answer—It is somewhat difficult at this time to say just exactly when I intend to furnish the complete data of the other hook-ups of Armstrong's super-regenerative receiver. You may rely upon my promise, however, that it will be done at an early moment. Although you may find some of the other circuits simpler than the one printed Sunday, July 2, the operation will be much more critical and not as well defined as the one printed Sunday. The diagram printed Sunday looks formidable, but, as a matter of fact, it is really very simple once the set is assembled, because the majority of the parts are standardized. The values, and do not have to be touched once they are in the set.

### Uni-Directional Current!

Question—In reference to diagram in Radio Corporation catalogue of November 1, 1921, page 38, showing standard wiring for a uni-directional current, is this diagram of audio-frequency amplification? This diagram will work on a "C" battery and "B" battery in the plate circuit of the last amplifying tube, and my question is, will it work on a "C" battery? It is not a direct current, is it? Is it direct current or intermittent flow and varying intensity? Will it work on a "C" battery? The diagram printed Sunday looks formidable, but, as a matter of fact, it is really very simple once the set is assembled, because the majority of the parts are standardized. The values, and do not have to be touched once they are in the set.

Answer—1. I cannot state specifically whether this particular tube can be used successfully or not, but, as I understand that it is not critical in regard to voltage, I should say that the probability is that it is all right. 2. If the tube will work on this circuit there will be no necessity to make changes in any of the values. 3. You can use the condenser that you have mentioned, provided that you place the condenser in the filament. 4. I would suggest that you use it in the plate circuit of the tube. 5. You can obtain a 1,250-turn coil for \$3.30 and the 1,500-turn coil for \$3.70. 6. Any coil wound on an insulating tube that has a total inductance value of ten millihenries will answer the purpose. 5. This type of choke coil is used in regular telephone installations in repeater circuits and can be obtained from houses dealing with such supplies much easier than it can be constructed. 6. The same is true with these resistances. I would suggest Lavite as the resisting material. 7. I cannot tell you just exactly what the cost of the various parts will be, other than those I have enumerated, but I would suggest that you get in touch with reputable stores in your city.

### More on Super-Regenerator

Question—Will you please advise me how to make a suitable iron core choke coil for Armstrong circuit? I have six fixed variable condensers. Is there any way of using them? Concerning the vario-coupler that rotor of same must have 4 1/2 inch turns wound with 23 D. C. 80 turns tapped every eight turns for adjustments. The rotor of feedback I intend to wind with No. 24 B. & S. D. C. wire, 150 turns flat if possible, or in bank coil. They are of fixed value, with the same. The diagram shows two wires from loop to the top of the inductor in inductance coil or does one act as a ground wire? I am not very familiar with loops. In fact, this will be the first I have ever used. Does positive of last "A" battery in diagram connect right? It appears to me to lead to the negative of first two tubes. Can I buy choke and filter coils complete of right capacities?—J. P. P.

Answer—Coil L4 can be the honeycomb coil of requisite number of turns to give you a total inductance of ten millihenries. Coil L5 is the regulation iron core choke coil used in telephone work for the purpose of a filter in regular repeater circuits. I think that you will be able to get one from any house dealing in regular telephone supplies, but be sure that it has the correct amount of inductance. You can try three of the 23-plate condensers in the places where the variable condensers are shown, but I do not think that they will have sufficient capacity, and you may have to shunt fixed condensers around them. However, you can try them out first in connection with the vario-coupler. What was meant by the story was that the rotor should have approximately twice as many turns as a normal rotor. I imagine that you probably have mistaken for an "A" battery on the last tube the "C" battery. This is a 2 1/2-volt battery, the negative of which is connected to the grid of the third tube. With regard to the loop, the two wires from the loop aerial are joined to the ends of the primary winding of your vario-coupler. The variable condenser, which is joined across the primary of the vario-coupler, acts as a tuning element for the loop aerial.

### Making Choke Coils

Question—I am about to construct the new super-regenerative set and I am referring to you for information. I would like to know how to make the following resistances: Open core iron core choke coil of 10 millihenries inductance with iron core, 12,000 ohms; iron core choke coil of 100 millihenries—C. L.

Answer—Coil L4 can be the honeycomb of the requisite number of turns to give a total inductance of 10 millihenries, and coil L5 is the regulation iron core choke coil used in telephone work for the purposes of a filter in regular repeater circuits.

### Distance With the Armstrong Circuit

Question—I am located about seventy-five miles distant from New York City. Will you please tell me if I shall be able to hear as well with the new Armstrong hook-up as I have been able to with the single vacuum tube set that I have now? I have received WJZ, W4Y, KYW and numerous other stations. I have a variable condenser in this set. How shall I make duo-lateral coils of 1,250 turns and the other of 15,000 turns? How shall I make an open core choke coil with a total inductance of 10 millihenries? How shall I make an iron core choke coil of 100 millihenries inductance? How shall I make two non-inductive resistances of 12,000 ohms? If any of these things have to be purchased please tell me the purchase price.—G.

Answer—1. Of course, I cannot tell you just exactly what results you will be able to get with the super-regenerative receiver, but I can say positively that it will give you greater volume than the single vacuum tube set you have experienced before. It must be understood, of course, that this set is operated on a loop aerial, and your previous good results were obtained from the aerial that you were using. 2. Five-watt tubes give the best results with the super-regenerative receiver. These are power tubes, requiring 7 1/2 volts in the filament. 3. You cannot make duo-lateral coils except with special winding arrangements, and it will be far cheaper for you to purchase the coils than to make them. You can obtain a 1,250-turn coil for \$3.30 and the 1,500-turn coil for \$3.70. 4. Any coil wound on an insulating tube that has a total inductance value of ten millihenries will answer the purpose. 5. This type of choke coil is used in regular telephone installations in repeater circuits and can be obtained from houses dealing with such supplies much easier than it can be constructed. 6. The same is true with these resistances. I would suggest Lavite as the resisting material. 7. I cannot tell you just exactly what the cost of the various parts will be, other than those I have enumerated, but I would suggest that you get in touch with reputable stores in your city.

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## Daily Radio Program

- Sunday, July 16
- WJZ, Newark (360 meters)
- 8 p. m.—Radio chapel services by Rev. Frank Mason North, Belmont on Dr. Williams' Pink Pills.
- 8:30 p. m.—"The Bubble Bath" by Ralph Marlow.
- 9 p. m.—Adventure stories for boys and girls. Navy years from "Sea Fighting" by Warren H. Miller.
- 9:45 p. m.—"New Ideas in Home Building" by Gardner Teal, of "The Builders' Exchange."
- 10 p. m.—Musical program.
- 10:30 p. m.—Concert by Mrs. Ralph P. McCormick. Miss Rita Perdue will sing. "Merri-Ly" by the piano. Program from "Madama Butterfly" by Giuseppe Verdi. "The Story of Ruth" by Mrs. W. E. Brown. "The Owl" by American Girls.
- 11 p. m.—Arlington official time.
- 11:30 p. m.—Jersey City (350 meters)
- 8:57 p. m.—Tuning test, room.
- 9 p. m.—Recital by James F. O'Neil, dramatic tenor. Charles F. Smith, soprano. Miss Rita Perdue will sing. "Merri-Ly" by the piano. Program from "Madama Butterfly" by Giuseppe Verdi. "The Story of Ruth" by Mrs. W. E. Brown. "The Owl" by American Girls.
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- 10 p. m.—"New Ideas in Home Building" by Gardner Teal, of "The Builders' Exchange."
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